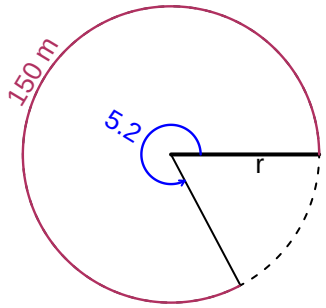
Name: Date:

Trig Final (Solution v2)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 150 meters. The angle measure is 5.2 radians. How long is the radius in meters?

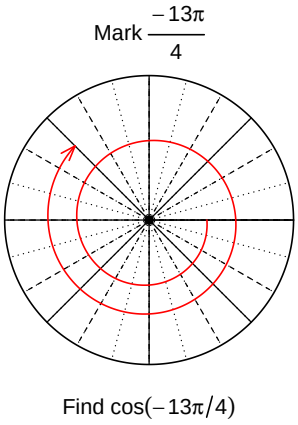


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

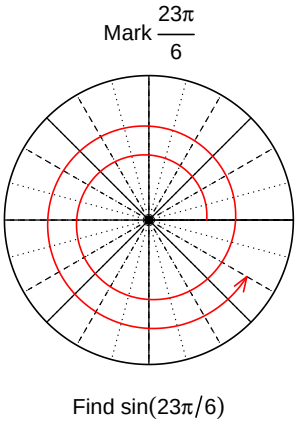
$r = 28.85$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-13\pi/4)$



Find $\sin(23\pi/6)$

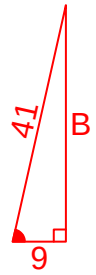
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(23\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

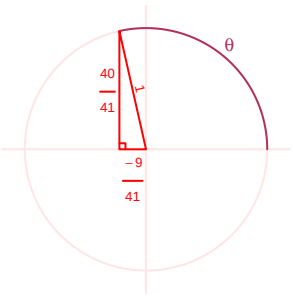
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{40}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.51 meters, a midline at $y = -2.23$ meters, and a frequency of 7.4 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.51\sin(2\pi 7.4t) - 2.23$$

or

$$y = -3.51\sin(14.8\pi t) - 2.23$$

or

$$y = -3.51\sin(46.5t) - 2.23$$